

Control

سأشبه ⑤

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Sketch Root Locus: -

$$G H(s) = K \frac{(s+2)(s+6)}{s^2 (s^2 + 4s + 8)(s+4)}$$

① $n_p = 5, n_z = 2$

② Real Part

③ Asymptotes

$$\# = n_p - n_z = 3$$

$$\sigma_c = \frac{\sum P - \sum Z}{n_p - n_z} = \text{zero}$$

$$\theta = \frac{(2L+1)180}{3} = \pm 60, 180$$

④ Breaking points

Breaking in between -6, -∞

$$K = \frac{s^5 + 8s^4 + 24s^3 + 32s^2}{s^2 + 8s + 12}$$

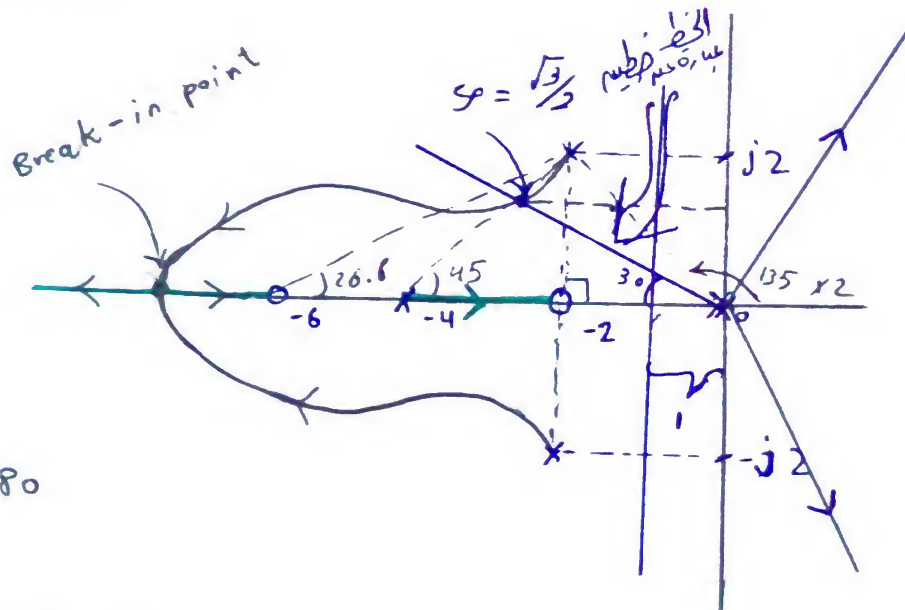
derivative Substitution

S	-6	-7	-7.5	-8	-8.5
K	✓	✓	✓	✓	✓

⑤ Range of K for stability
 $1 + G H(s) = 0$

$$s^5 + 8s^4 + 24s^3 + 32s^2 + K(s^2 + 8s + 12) = 0$$

$$s^5 + 8s^4 + 24s^3 + (32+K)s^2 + 8Ks + 12K = 0 \quad \text{ch. eq.}$$



موض بقیہ، بقصر ضام، ار ك هتقلته
تزيد مرة أخرى، نقطة هي نقطة القبول
بين التناقص والتزايد

s^5	1	24	8K
s^4	8	$32+K$	$12K$
s^3			
s^2			
s^1			
s^0			

سكالا



⑥ departure angle :-

$$\begin{aligned}\theta_D &= 180 - \theta_p + \theta_z \\ &= 180 + 28.6 - 90 - 270 - 45 - 90\end{aligned}$$

\uparrow 135°

Matlab Code :-

$$\text{num} = [1 \ 8 \ 12];$$

$$X \Rightarrow \text{den} = \text{conv}([1 \ 0 \ 0], [1 \ 4 \ 8], [1 \ 4]);$$

$$\checkmark \Rightarrow \text{den} = \text{conv}(\text{conv}([1 \ 0 \ 0], [1 \ 4 \ 8]), [1 \ 4]);$$

$$G = \text{tf}(\text{num}, \text{den});$$

$$r \text{ locus}(G)$$

ال Conv يعيد بين اثنين فقط ، لو اتركهم اثنين ، فكل Conv لثلاثة
والناتج نضعه مع Conv الى بعده

* Required

$$\gamma = \frac{\sqrt{3}}{2}, \quad t_s = 4$$

Choose closed loop poles that achieve the desired requirements

مطلوب التردد مع بعض، هات كل شرط ثم هات المقام

$$\phi = \cos^{-1} \gamma = \cos^{-1} \frac{\sqrt{3}}{2} = 30^\circ$$

$$\frac{4}{\omega} = 4 \Rightarrow \omega = 1 \Rightarrow \text{doesn't belong to the root locus}$$

$$K = \frac{lp_1 lp_2 \dots lp_n}{lz_1 lz_2}$$

input: sinusoidal

